

## PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

## Squirting or Spraying Devices

We, ROTHERHAM & SONS LIMITED, a British Company, and BETTY KEVITT ROTHERHAM, a British Subject, both of the Company's address, 27, Spon Street, Coventry, Warwickshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a manually-operable squirting or spraying device (for a powdered material, or, more particularly, for a liquid) of the kind operating by air pressure.

A common form of manually-operable spraying device involves the use of a rubber bulb for generating the air pressure which is injected into and along a venturi orifice, so that the ensuing sub-atmospheric pressure will draw the material to be sprayed along a passage leading to the orifice. A device of that character, however, requires the use of two hands, one to hold the device and direct the spraying nozzle, and the other to work the bulb.

The main object of the present invention is to provide a manually-operable spraying or like device which can be operated in a convenient manner by one hand.

According to the invention, the air pressure is generated by relatively-movable plunger and cylinder members of which the movable member is operated, directly or indirectly, by a toggle action including an actuating link which is pivotally mounted for movement about an axis fixed with respect to the stationary of the said members, and is arranged so as to be conveniently engaged by the user's hand whilst the latter is supporting the device.

According to a further feature of the invention, the operation of the said movable member is effected by a pair of similar, oppositely-disposed actuating links respectively engaged by the fingers and either the thumb or that portion of the

palm of the hand which is adjacent the thumb.

In the accompanying drawings:—

Figure 1 is an elevation, with part of the casing broken away, of a spraying device according to the invention;

Figure 2 is a fragmentary view in which the actuating link shown is in section; and

Figure 3 is a fragmentary section taken on the line 3—3 of Figure 1.

In the construction shown, there is a tubular container 11 for the powder or liquid 12 to be sprayed, the upper end of the container being closed by means of a cap 13 which can be removed for charging the container. This container constitutes the stationary member of the pressure-generating plunger and cylinder members, the movable member thereof being a cup-shaped plunger 14 slidably coacting with the lower end 15 of the container 11. A coil compression spring 16 (omitted from the bottom of Figure 3) biases the plunger 14 downwardly relatively to the stationary casing 11.

The air space 18 between the two members is in communication with the lower end of a pipe 19 (Figure 3) passing through the bottom wall 15 of the casing 11 and entering a venturi tube 20, within which the upper end of the tube 19 is formed as a jet nozzle (not shown) directed towards the spraying opening 21. The other end of the venturi tube is connected to a down pipe 23 terminating just above the bottom wall 15. When the plunger 14 is being raised, air compressed in the space 18 is forced along the pipe 19 and through the jet nozzle (not shown), thereby creating a sub-atmospheric pressure within the venturi throat so as to draw up the liquid or powdered material 12, in a manner known *per se*, which is sprayed through the spraying opening 21 admixed with air. Air enters the space 18 through a one-way inlet valve 24.

In the present instance there is secured

[Price 2/-]

to the container 11, just below the closing cap 13, a band 25 which is fast with two parallel, diametrically-opposite frame members 26 united at their lower ends by a bridging strip 27. A casing 28, of elongated cross-section, is adapted to be secured at its upper end to the band 25, whilst the lower open end of the casing is closed by a cap 29 which is also secured to the bridging piece 27. The casing has diametrically-opposite elongated slots 31 in it through which extend handgrip parts 32 of actuating links 33 pivotally mounted at 34 upon the frame members 26, the actuating links being hollow ones as shown. At their lower ends they are hinged at 36 to the adjacent ends of a pair of cross links 37 which are pivotally connected together at 38. The spring 16 forces the plunger 14 into engagement with the upper ends of the links 37 and thereby forces the actuating links 33 outwardly, their outward movement being limited by engagement with the casing 28. Rollers may, if desired, be provided at the upper ends of the links 37 to bear upon the lower surface of the plunger.

Thus, when the upper chamber is charged with scent, disinfectant, or other desired liquid or powder 12, a person can hold the device in one hand, with the fingers engaging one of the handgrip portions 32 and the palm at the root of the thumb engaging the other, and by alternately contracting the hand and then releasing the grip the plunger 14 is reciprocated, thus spraying the material through the venturi orifice. Whilst spraying in this way it is an easy matter to direct the spray just where required.

In an alternative arrangement, for giving a more balanced delivery, there may be interposed between the upper chamber 11

for the liquid or powder and the pressure space 18, a balancing pressure chamber 45 connected to the lower end of the pipe 19 by a restricted opening which is smaller than that by which it is connected to the pressure space 18, the latter opening then being provided with a non-return valve. Thus, two or three pump strokes will be necessary to generate full pressure in the interposed, balancing chamber, and thereafter spraying will continue almost continuously whilst the plunger is being reciprocated, and for a short period when the plunger again becomes stationary.

What we claim is :—

1. A spraying device, for a liquid or powdered material, operating by air pressure which is generated by relatively movable plunger and cylinder members, of which the movable of said members, is operated, directly or indirectly, by a toggle action including an actuating link which is pivotally mounted for movement about an axis fixed with reference to the stationary of the members and is arranged to be conveniently engaged by the user's hand whilst the latter is supporting the device.

2. A spraying device, according to Claim 1, but in which operation of the said movable member is effected by a pair of similar, oppositely-disposed actuating links respectively engaged by the fingers and either the thumb or that portion of the palm of the hand adjacent the thumb.

3. A spraying device, substantially as described with reference to and as shown in the accompanying drawings.

Dated this 24th day of February, 1950.

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## PROVISIONAL SPECIFICATION

### Squirting or Spraying Devices

We, ROTHERHAM & SONS LIMITED, a British Company, and BETTY KEVITT ROTHERHAM, a British Subject, both of the Company's address, 27, Spon Street, Coventry, Warwickshire, do hereby declare the nature of this invention to be as follows :—

This invention relates to a manually-operable squirting or spraying device (for a powdered material, or, more particularly, for a liquid) of the kind operating by air pressure generated by relatively-movable plunger and cylinder members.

A common form of spraying device involves the use of a rubber bulb for

generating air pressure which is injected into and along a venturi orifice, so that the ensuing sub-atmospheric pressure will draw the material to be sprayed along a passage leading to the orifice. A device of that character, however, requires the use of two hands, one to hold the device and direct the spraying nozzle, and the other to work the bulb.

The main object of the present invention is to provide a spraying or like device which can be operated in a convenient manner by one hand.

According to the invention, the movable of the relatively-movable plunger and

cylinder members is operated, directly or indirectly, by a toggle action including an actuating link which is pivotally mounted for movement about an axis fixed with respect to the stationary of the said members, and is arranged so as to be conveniently engaged by the user's hand whilst supporting the device.

According to a further feature of the invention, the operation of the said movable member is effected by a pair of similar, oppositely-disposed toggle actions of which the two actuating links are respectively engaged by the fingers and either the thumb or that portion of the palm of the hand which is adjacent the thumb.

In one construction according to the invention, there is a brass tube with a partition between its ends above which the liquid, or powdered material, is placed, and below which operates a plunger, the air space above the latter communicating with a small opening in the partition connected by a passage-way leading, through the wall of a venturi orifice communicating with a spraying opening in the tube end, to a jet disposed in the throat, the orifice being connected by a down-pipe leading to just above the partition. When the plunger is being raised the compressed air forced through the jet creates a sub-atmospheric pressure within the venturi orifice and draws up liquid or powdered material, in a manner known *per se*, which is sprayed through the orifice admixed with air.

In the present instance the lower end of the brass tube has diametrically opposite longitudinal slots in it in which can work a pair of links (each being one of a toggle action) hinged to a short rod extending downwardly from the plunger, and the other ends, i.e., the outer ends, of the links, are respectively hinged to two actuating links or levers of the toggle actions pivotally mounted for movement about parallel axes at the upper end of, but outside, the tube. When the plunger is fully withdrawn the two actuating links are inclined to one another, their lower ends being spaced apart to a greater extent than their other hinged ends, and a spring means is provided for biasing them to this position, for example a compression spring interacting between their lower ends and passing below the lower end of the tube, or a compression spring disposed in the air pressure chamber to interact between the partition and the plunger.

A wedge-shaped casing, of plastic or

other material, is mounted round the tube, partly to screen the inner edges of the two actuating links or levers when fully separated, and the casing is slotted along its sides to receive the levers when pressed towards one another to free the plunger upwardly, the casing providing abutments for the inner edges of the levers which will prevent separation of the levers to an extent which would be sufficient to allow of those two links, connected to the plunger rod, becoming aligned with one another i.e., those two links, when the plunger is fully lowered, make an obtuse angle with one another which is convex towards the plunger.

The actuating levers may be of channel section, and closed at their lower ends, the associated links engaging these closed corners without any hinge pins.

Thus, when the upper chamber is charged with scent, disinfectant, or other desired liquid or powder, a person can hold the device in one hand, with the fingers engaging the lever of one of the toggle actions and the palm at the root of the thumb engaging the other, and by alternately contracting the hand and then releasing the grip the plunger is reciprocated thus spraying the material through the venturi orifice. Whilst spraying in this way it is an easy matter to direct the spray just where required.

If desired, the outer edges of the two actuating levers may be serrated, to obviate the possibility of the fingers or the palm of the hand slipping along them.

In some cases it may be desired that a longer pump stroke should be obtained for a given size of device, and in this case the two toggle actions abovementioned can be indirectly connected with the plunger through a lazy tongs or other multiplying mechanism.

In an alternative arrangement, for giving a more balanced delivery, there may be interposed between the chamber for the liquid or powder and the pressure chamber, a balancing chamber connected with the liquid, etc., chamber by a restricted opening which is smaller than that by which it is connected to the plunger chamber, the latter opening (to the plunger chamber) being provided with a non-return valve. Thus, two or three pump strokes will be necessary to generate full pressure in the interposed or balancing chamber, and thereafter spraying will continue almost continuously whilst the plunger is being reciprocated, and for a short period when the plunger again becomes stationary.

Dated this 14th day of April, 1949.

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